DOCUMENT RESUME

ED 166 039 SE 026 371

TITLE	An Educator's Guide to Teaching Metrication.
INSTITUTION	Sears, Roebuck and Co., Chicago, Ill.
PUB DATE	77
NOTE	9p.; Contains occasional shaded drawings that may not reproduce well; Not available in hard copy due to copyright restrictions
AVAILABLE FROM	Consumer Information Services - D/703, Sears, Roebuck and Co., Sears Tower, Chicago, IL 60684 ($0.25; No charge for use in staff development meetings on subject)
EDRS PRICE	MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS	Consumer Education; Elementary Secondary Education; Instruction; Interdisciplinary Approach; *Learning Activities; *Mathematics Education; *Measurement; *Metric System; *Objectives; Student Projects; *Teaching Guides

ABSTRACT

This guide was developed to help in planning a unit on the more important aspects of metric conversion or to incorporate metric concepts and understandings into different subject matter areas. It includes: background information, key concepts, instructional objectives, learning experiences, multidisciplinary projects and assignments, and sources of information. (MP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED166039

AN EDUCATOR'S GUIDE TO

teaching metrication

Sears EDUCATOR RESOURCE SERVICE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Terry J. Finlayson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

DO YOU SPEAK METRIC?

The metric system of weights and measures remains a mystery to many of us. Of course, we've heard about it, perhaps even use it — yet we continue to be apprehensive because it's a little like the tomorrow we hoped would never become today.

Officially, at least, that "today" is **now.** Medicines, drugs, certain food products, cameras, and film and many other consumer goods are already described and sold in metric terms. Several major manufacturers are producing according to metric specifications while others have formal plans to go metric over a period of 10 or more years. And in virtually every state, legislation or school board regulations require the teaching of the metric system in public schools.

While conversion to metric holds many advantages for the nation, the economy, and consequently the individual consumer, no one suggests that the changeover will be either easy or quick. It is hoped that this guide will help students and teachers learn together — painlessly.

A LOGICAL LANGUAGE

Actually, the metric system is simpler and more logical than our customary tangle of inches, feet, yards, ounces, quarts, and pounds. It takes advantage of our decimal number system by relating multiples and submultiples of units by powers of 10. For example, the meter, which is the basic unit of length in metrics, is divided by 100 and 1000 to get centimeters and millimeters, respectively, and multiplied by 1000 to get kilometers.

Our customary system is much more complicated. For instance, we divide feet by 12, or yards by 36 to get inches, and pounds by 16 to get ounces avoirdupois, or quarts by 32 to get liquid ounces.

With metric units, computation may require no more effort than adding zeros or moving a decimal point. Little wonder that it has been estimated that six months to two years of elementary school arithmetic might be eliminated with the adoption of the metric system.

The modern metric or SI *(le Système International d' Unités or International System of Units)* is composed of three classes of measurements: base units, derived units, and supplementary units. The base units are:

- **meter**—unit for length
- **kilogram**—unit for mass (commonly called weight)
- **second**—unit for time
- **ampere**—unit for electric current
- **kelvin**—unit for temperature (although most readings will be given in degrees Celsius)
- **mole**—unit amount of substance
- **candela**—unit for luminous intensity

The derived units, of which there are dozens, are defined in terms of the base units. For example, electrical power uses these terms: watt (W), volt (V), and kilowatt-hour (kW·h). The liter, while not an SI unit, is commonly used to measure fluid volume.

A consistent system of prefixes is used to designate multiples and submultiples of the basic units; for example, kilo, hecto, deka, deci, centi, and milli.

Symbols for most of the units and prefixes, such as m for meter, cm for centimeter, g for gram, kg for kilogram are not capitalized nor are any followed by a period. Symbols for a few units—like L for liter, mL for milliliter and those named for famous scientists—like kelvin (K), degree Celsius (°C), and watt (W) are capitalized. This is in accordance with proper SI usage which is being adopted in all metric nations and will be used in this country as we convert.

To give some perspective on the system, a meter is slightly longer than the customary yard (approximately 1.1 yards), the liter is slightly larger than the quart, and the kilogram is approximately 2.2 pounds.

METRICS — PAST, PRESENT, AND FUTURE

A metric system originated with a Frenchman, Gabriel Mouton, who proposed a decimal system in 1670. Not until 1791, however, was an early form of the present system adopted by his own country. Slowly, other countries followed and by 1880, most of Europe and South America had converted to metric. Only Great Britain and the U.S. remained with a system based in part on barleycorns, a Roman soldier's stride, and the span from the end of King Henry II's nose to his outstretched hand.

SE 026 371

Various leaders of our country have attempted to get us out of the maze—George Washington, Thomas Jefferson, and John Quincy Adams all urged and proposed that the U.S. adopt a more uniform system of weights and measures. And more than 100 years ago, in 1866, Congress did make the metric system legal but not mandatory for use in this country.

The first professional group to take advantage of this legislation were pharmacists who gave up their grains and drams for grams and liters.

And that's about where things stood until 1965 when the United Kingdom announced it would adopt the metric system. This left the U.S. virtually alone — a large island in a much larger metric sea.

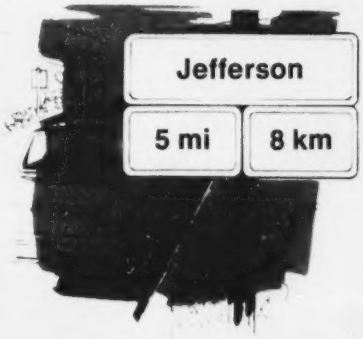
In 1968, Congress passed the Metric Study Act which funded a $1.4 million study to be conducted under the auspices of the Secretary of Commerce. Released in 1971, it was titled "A Metric America: A Decision Whose Time Has Come." The report concluded that the U.S. should change to the metric system through a coordinated national program so that within 10 years, it would become predominantly, though not exclusively, metric.

In response to these recommendations, several bills dealing with metrics were introduced in Congress. Out of these came PL 94-168 which was signed into law by President Gerald R. Ford on Dec. 23, 1975. The Metric Conversion Act's major points are:

- conversion will be voluntary (without explicit government mandate). Conversion will "evolve" within the private sector, with the federal government monitoring, but not controlling, the process.
- there is no specified timetable for national conversion — each sector of the economy will convert at its own speed based on its own needs, opportunities, and constraints.
- a 17-member U.S. Metric Board will be established to assist in planning and coordinating the changeover. This Board will have representatives from all sectors which are or will be affected by metric implementation and will report annually to the President and Congress on findings and recommendations.
- no specific provisions are made for government financial assistance to businesses, industries, and individuals to implement the change. However, the U.S. Metric Board will research and recommend to the President and Congress any action appropriate to deal with any "unresolved problems" which may include the impact on workers (cost of tools and training); on different occupations and industries; on small businesses; and on the national economy as a whole.
- SI (the *International System of Units)* will be followed.

CONSUMER EDUCATION

Public education about the metric system is underway. According to a state education survey by the National Bureau of Standards, departments in all 50 states reported some level of metric activity, ranging from California's schools which began teaching only the metric system last year, to teacher workshops in a number of states, to various formal "go metric" resolutions of other states.



A metric education program of the U.S. Office of Education awarded 72 grants totaling $2.2 million in the first year of a three-year program. More local school districts applied for federal grants the second year of the program, USOE reports, as opposed to the first year's grants which went to large agencies and institutions to develop metric curriculum plans and sponsor core teacher training programs.

Meanwhile metric education continues on other fronts. Transportation departments in a number of states are using highway distance and speed limit signs in metric units.

Our neighbor to the north, Canada, is well into its conversion—all road signs have been converted to kilometers; weather reports feature temperatures in degrees Celsius, rainfall in millimeters, snowfall in centimeters; and consumers buy many of their supermarket commodities in metric packages.

WHY CONVERT?

Even with all this flurry of metric activity, many still ask "Why?" Why is the United States converting to a strange system of weights and measures with all the sweeping changes such a switch will necessitate?

One basic answer to that question appears to lie right in the national pocketbook. The most important thing about the metric system, its supporters say, is what it will do for the nation's foreign exports and balance of trade. The 1971 "Metric America" report estimated that U.S. marketers would have been exporting $600 million more goods in 1975 if they had gone metric in 1970.

To gain acceptance in foreign markets, many products must mate or interface with a similar European product. If their standards are metric—and we want to be in that market —we need to go metric, too.

But there are also arguments against the conversion. Opposition has come from a major labor union and from some small business spokesmen. They object on the basis of expense — maintaining that the costs of retraining personnel, replacing tools, and redesigning manufacturing equipment will be prohibitively high. Job losses are feared also by some.

When metric legislation was pending and with industry committed to metric conversion at an accelerating rate, the need for a coordinating center for metric activities became evident several years ago. To help fill the void, the American National Standards Institute (ANSI) established the American National Metric Council (ANMC) which is supported by subscriptions from organizations, companies, and individuals. Through its coordinating and sector committees, the ANMC assists all segments of the economy in planning, coordinating and implementing the voluntary change to the metric system in the U.S.

SEARS INVOLVEMENT WITH METRICATION

Sears, Roebuck and Co. was one of the charter members of ANMC and is represented on the ANMC Board of Directors. Currently, Richard B. Priest, Assistant Manager of Sears Merchandise, Development and Testing Laboratory, is chairman of the ANMC Consumer Products Coordinating Committee.

Sears established an internal Metric Committee in 1967. Members monitor trends in the use of metrics throughout the country and inform management of any developments that might influence the company's merchandising practices. The committee also studies the social effects of metrication to see how Sears can help advance consumer education in this area.

In a speech at the 1977 ANMC national conference, Sears President, A. Dean Swift, reported that "We would be disappointed if our suppliers did not recognize the need and the opportunity for a conversion to the metric system in the design and packaging of their products, so that by the middle of the next decade, Sears new products and operations would be completely metric."

Swift pointed out that the company's top priority "must and will continue to be education — of our customers and our employes.

"To inform our customers," he said, "we will gear every part of our organization, from our selling practices to our store signing, toward giving our customers a good working knowledge of the system so they can buy merchandise intelligently and confidently.

"This can only be accomplished if we ourselves have a good working knowledge of this system," he added. And as a first step toward that goal, the Sears Extension Institute has begun offering a course to teach Sears employes the SI system of measurement.

"Metric conversion cannot happen overnight," Swift continued. "There will be expenses and there will be problems. But problems won't mean crises if plans are developed well in advance. We are working on a plan and we urge other industries to do the same."

Swift concluded, "The time to begin is now."

teacher's guide

This guide was developed to help you plan a unit on the more important aspects of metric conversion or to incorporate metric concepts and understandings into different subject matter areas. It includes:

- **Key Concepts**
- **Instructional Objectives**
- **Learning Experiences**
- **Multidisciplinary Projects and Assignments**
- **Sources of Information**

KEY CONCEPTS

A working vocabulary in both the customary and the metric systems will be important for today's school-age children since both systems will be used during their lives. The following key concepts are provided to help you organize and introduce your material. The chart presents additional terms for your students to define in both the metric and customary systems.

Key Concepts and Descriptions

- **Metrology** — the technology of weights and measures.
- **Customary System** — the English or customary system of weights and measures used by the U.S. which originated from the customary practices of a variety of cultures.
- **Metric System** — the original decimal system that provided a set of units for the measurement of length, area, volume, capacity, and mass, etc., based on three fundamental units: the meter, the gram, and the second.
- **International System of Units** — SI is a modernized version of the metric system. It is based on the meter-kilogram-second-ampere (MKSA) system and incorporates seven base units, two supplementary units, and a series of derived units and prefixes.

Quantity	Common Units	Symbol
length	kilometer	km
	meter	m
	centimeter	cm
	millimeter	mm
mass	megagram	Mg
	kilogram	kg
	gram	g
	milligram	mg
volume	cubic meter	m^3
(capacity)	cubic decimeter	dm^3
	cubic centimeter	cm^3
(fluid measure)	liter	L
	milliliter	mL
temperature	kelvin	K
	degree Celsius	°C
velocity	meter per second	m/s
	kilometer per hour	km/h

INSTRUCTIONAL OBJECTIVES

General objectives of a unit on metrication could include helping your students:

- to **become aware** of the relative positions of the customary and the metric systems in world markets.
- to **understand** the metric system and its advantages in the marketplace.
- to **use** metric measurements now that the system is being officially adopted.

In addition, the following instructional objectives focus on what the student should know when the metric unit is completed. Teachers may want to prepare more specific and measurable learning outcomes based on those aspects emphasized in their classroom.

In the cognitive domain, instructional objectives at different levels may include:

Level I	**Knowledge**	Student knows common units of measurement in the metric system.
Level II	**Comprehension**	Student understands necessity and advantages of U.S. conversion to the metric system.
Level III	**Application**	Student solves mathematical problems by use of metric units.
Level IV	**Analysis**	Student recognizes the simplicity of learning and using the metric system as compared to the customary system.
Level V	**Synthesis**	Student proposes a plan to use in substituting metric units for customary units in given situations.
Level VI	**Evaluation**	Student judges U.S. conversion to the metric system in economic terms.

In the affective domain, instructional objectives at different levels may include:

Level I	**Receiving**	Student shows an awareness of the importance of becoming familiar with metric units.
Level II	**Responding**	Student participates in class discussions of the advantages and disadvantages of the U.S. conversion to the metric system.
Level III	**Valuing**	Student appreciates the role metrication will play in improving the U.S. position in world trade.
Level IV	**Organization**	Student recognizes the need for a well-planned transition from the customary to the metric system of measurement.
Level V	**Development of a Characteristic Value System**	Student demonstrates willingness to learn and use the metric system—and looks for opportunities to use metric units.

LEARNING EXPERIENCES

DISCUSSION QUESTIONS

Well chosen questions motivate learning in a variety of ways. The questions selected will depend on the material being stressed in the classroom, the background of the students in the subject, and the way in which questions will be used. Use discussion questions to:

- stimulate inquiry and discussion within the group.
- serve as topics for independent study and research.
- bring out differing points of view for debate.
- introduce students to different aspects of metrology and conversion to the metric system.

---

1. What are the major advantages of more widespread use of the metric system?
2. What are the disadvantages?
3. How do **you** feel about using the metric system?
4. Which countries are still remaining on a non-metric system?
5. How will conversion affect foreign trade?
6. What are the basic differences between the metric system and the customary system of measurement?
7. What metric units are already in use in the U.S. and in what product lines are metric units common?

8. How will metric conversion affect consumer education?
9. What are some ways to facilitate the conversion?
10. What would be the most difficult adjustments for American people to make in converting to the metric system?
11. What segments of the economy stand to gain through metrication? Which will lose?
12. How might a working knowledge of metrics be an advantage in the job market? In what fields would it be most helpful?
13. How will metrics affect...
    - running the home?
    - shopping for food?
    - buying home furnishings?
    - buying clothing?
    - traveling?
    - manufacturing and servicing of autos?
14. Why has there been so much resistance to the metric system in the U.S.?
15. What are the benefits of using a uniform measuring system throughout the world?

INDIVIDUAL STUDENT ACTIVITIES

Individual activities are particularly useful in adapting material to meet individual needs, abilities, and interests. From the following suggestions, help students select those activities that are most appropriate and challenging for them.

Shopping Assignments—Choose a product line such as food, cosmetics, drugs, hardware, medical devices, or sports equipment and shop for items in that product line which carry labels or descriptions in metric units. Report findings to the class. Shopping can include store visits or reviewing mail order catalogs, or magazine, newspaper, and TV advertisements.

Legislative Review—Investigate and report on the passage of the Metric Conversion Act (PL 94-168). Include a brief history of original legislative proposals and laws related to the metric system; an outline of the major provisions of PL 94-168; prevailing views of legislators about the legislation; possible costs of conversion; what the consequences might be if U.S. failed to convert.

Metric Motoring—Plan a motor trip to a fairly distant city. Figure the distance in kilometers and speed in kilometers per hour.

Practical Viewpoints—Arrange an interview and tape the comments of one of the following people on the merits and demerits of metrication for the U.S. Share the tapes with the class and follow up with discussion and, where indicated, with further research. Possible interviewees include: pharmacists, appliance repairmen, auto repairmen for domestic and for foreign cars, nurses, doctors, science teachers, food editors, sports commentators.

Me in Metric—Find out how metric measurements relate to your body; which of your fingernails is almost 1 cm wide? What does the span between the end of your thumb and the end of your little finger measure in cm? With your arm out, measuring from the tip of your middle finger, where does a meter measure on you? Your nose, your shoulder?

GROUP PROJECTS

Group projects may be carried out by the class as a whole or by small groups or teams within the class. Choose the projects that are most appropriate for your group and the metric concepts you are teaching.

Conversion Programs—Outline specific steps that each of the following groups could take to facilitate a smooth conversion to the metric system. The class can be divided into small teams, each taking one of the groups for this project.

- educators
- retailers
- manufacturers
- the press
- government (local, state, federal)
- consumer groups
- television and radio stations
- individuals

Metric Survey—Conduct a survey of the student body and families of students to determine:

- what people know about the metric system.
- how people feel about the ongoing conversion to metric.
- reasons given in favor of conversion.
- objections given by those opposed to conversion.

Try to categorize responses according to age levels, educational levels, and occupations. Tabulate results and form conclusions. Write them up in a summary for the school or local paper.

Metric Center—Collect and catalog recent, significant articles, books, and pamphlets on metrology to serve as reference materials. Use them to set up a metric resource center in the school library or other appropriate location.

Show and Tell—Set up a display of metric and customary measuring devices to illustrate the relationships and differences between them. If possible, present a demonstration for individual classes or the student body on measuring in metric units.

Think in Metric—Divide class into groups and give each a list of measurable objects found in the room (length of chalkboard, eraser). Each group estimates length of each item, then groups exchange papers and students actually measure items.

multidisciplinary projects and assignments

This section is directed to individual subject matter areas and specific disciplines. Choose those projects that are most appropriate for the subject that you teach. Or, the material may be used as a guide for a school-wide program on metrication.

ART

- Design posters and bulletin boards to illustrate the major differences between the customary and the metric units of measurement.

- Make up cartoons to illustrate the humorous aspects of metric conversion.
- Use metric units to measure quantities of art supplies where appropriate.
- Make a mural-type poster or painting depicting the history of weights and measures. Show measuring units and devices used through the ages.
- Design posters and sample labels in dual dimensions which would be helpful to the public during a transition period between the customary and metric systems.

ENGLISH

- Write up a glossary of metric terms for the average person working with metrics for the first time.
- Search for references to weights and measures in literary works to determine: (1) What, if any, difference a change in terminology would make in the literary value of the work. (2) The extent to which metric units have been used in literary works since the 1800s. (3) The need for knowledge of the metric system in order to grasp the full meaning of a certain work.
- Prepare a series of essays for the school or local newspaper on the advantages of the ongoing metric conversion for the U.S. Cover the economic, social, educational, and psychological aspects of conversion on our society.

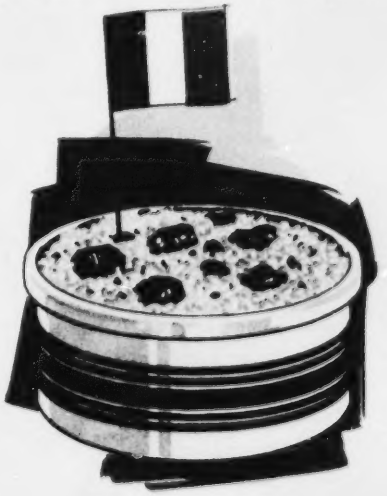
HISTORY AND SOCIAL STUDIES

- Prepare and give an illustrated talk on the history of weights and measures: (1) in the U.S.; (2) in another country of your choice; (3) in the world; (4) in a given historical period.
- Draw up a time line depicting significant developments in systems of weights and measures throughout history.
- Research and report on the impact of different systems of measurement for a specific nation and period in history as related to: (1) everyday living; (2) domestic trade; (3) foreign trade; (4) government affairs.
- Choose any three of the following individuals and write brief biographical sketches and descriptions of each person's contribution to—or connection with—weights and measures.

  James Watt
  Johannes Gutenberg
  Galileo
  Charles A. de Coulomb
  Joseph Mayer
  G. S. Ohm
  Andre Ampere
  Michael Faraday
  John Quincy Adams
  Gabriel Mouton
  Col. Manley R. Gibson
  Thomas Jefferson
  Dr. A. C. McNish
  Napoleon

HOME ECONOMICS

- Research how foreign cooks measure food quantities in metric units. Then find a metric recipe and have students prepare it, using both systems of measurement—by weight and by volume. Ask class if one system was easier than the other. Which ingredients were more easily measured by weight and which by volume?



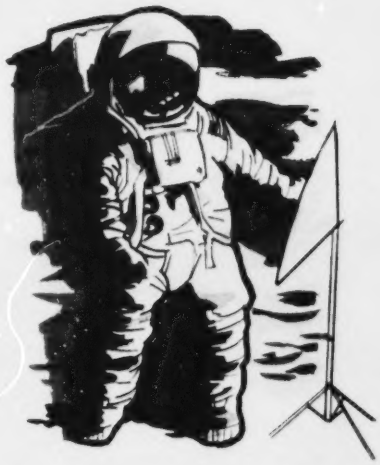
- Compute fabric requirements for draperies, slipcovers, and an article of clothing in metric units.
- Take body measurements in metric units. Determine size with a metric pattern chart.
- Research how clothing is sized in some of the countries already metricated, for instance France or Great Britain.
- Take dimensions of the classroom including floor area, ceiling height, and window sizes in metric units.
- Determine carpet or tile requirements for a given floor area in metric units.
- Conduct a supermarket survey to find out: (1) what products have labels in metric units exclusively; (2) what products are most frequently dual-labeled; (3) what products are not metrically labeled; (4) what value metric labeling is to the average consumer at this time.
- Collect and display metric measuring tools and devices that would be used in households.
- With a Celsius thermometer, measure and record the temperature of the following items: ice water, tap water, boiling water, refrigerator, freezer, and room temperatures.

CONSUMER EDUCATION

- Explore and discuss the advantages and disadvantages of converting to the metric system from the consumer's point of view.
- Describe point-of-sale aids and guides that would help consumers make informed choices when metric units become predominant in stores.
- Write a letter to a major company, asking what its plans are for implementing the metric system within the next 10 years. Research company before writing.

SCIENCE

- Study and report on how widely the metric system is used in science. Support your answer with examples and reasons.
- Explain why the metric system is simpler than the customary system.
- Explore and discuss the problems that would most likely arise if more than one system of weights and measures were used in scientific research and development.
- Give a demonstration on actually taking different weights and measures by the metric system.



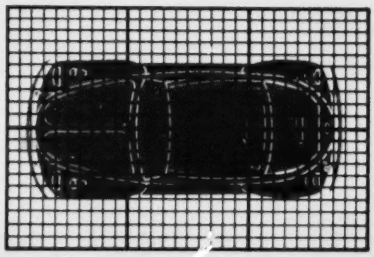
- Pick several major scientific developments or breakthroughs and determine what, if any, contribution was made by use of metrics.

ECONOMICS

- Describe the impact conversion might have on imports, exports, and domestic trade.
- Draw a relationship between conversion to the metric system and the U.S. balance of payments problems. How and when and in what key areas will conversion affect the balance of payments picture?
- Investigate and outline the short- **and** long-term effects of metric conversion on: (1) prices; (2) job opportunities and training; (3) big businesses; (4) small businesses; (5) inflation; (6) government operations; (7) supply and demand; (8) labor; (9) consumers.
- Evaluate and report on the consequences if the U.S. had failed to convert to the metric system. This should include trade, negotiations with foreign countries, technology, industrial development, etc.
- Analyze and report on the economic aspects of metric conversion in other countries.
- Analyze and discuss predictions of the cost of metric conversion for the U.S.

DRIVER'S TRAINING

- Convert mileage, distances, and highway signs to metric units (use rounded off units).
- Find kilometers per liter for your automobile. Determine best gasoline buy by price per liter.
- Write up questions that could be included in a state driver's test to evaluate a driver's knowledge of the metric units that are used in motoring.
- Investigate and report on the U.S. metric system's relationship to the foreign car market and servicing of foreign cars.



PHYSICAL EDUCATION

- Have students measure and mark off running courses of 50 and 100 meters using 10 and 25-meter tapes that they have made.
- Time students while they run the measured distances. Let each student use his or her scores to figure how far he could run in one minute if he maintained his 100-meter speed; how fast he could run a kilometer if he could maintain his 50-meter speed for the full distance; and what his speed was in meters per second at each distance.
- Let students measure in metric units the distance that each can long jump. Have students record these daily or weekly on a graph. Also show the class average.

DISTRIBUTIVE EDUCATION

- Design a display for your DECA Club to use at a school career day, drawing the blueprints according to metric specifications.
- Role play a salesperson who uses a metric tape to get correct measurements for a custom-made suit. Discuss how the measurements differ from those taken with a regular measuring tape. Will the use of metric measurements affect the fit of the garments?
- Discuss the possible effects of a conversion to metric usage in the various departments of a good sized store — for instance, clothing, appliances, hardware, candy, home furnishings, cameras, drug items, etc.
- Using one of the newer dress patterns with metric measurements and a metric rule, role play a clerk assisting a customer in buying the correct quantities of fabrics and findings to make a garment based on information shown on the pattern envelope.
- Role play a gas station attendant giving directions in metric units to a customer who wishes to go to a nearby town.
- Ask class members to rewrite various appliance pages of general merchandise catalogs or newspaper ads which give detailed size dimensions for the products, substituting metric units for customary measurements and weights. Follow up with a class discussion of the impact that the conversion to metrics will have on the advertising and printing industries.
- As a class or individual project, develop attractive point-of-sale instore signing for various departments to assist customers in using metric units when making buying decisions.
- Ask students to imagine they are buyers for a store of their choice. What advantages and disadvantages will they find in converting to the metric system of weights and measures?
- Discuss how the conversion to metrics will affect appliance servicing and the repair parts industry. What steps can manufacturers and retailers take to assure consumer confidence and satisfaction during and after the conversion to metrics?

INDUSTRIAL ARTS

- Measure the standard pieces of lumber such as a 2 x 4, 1 x 6, etc., in metric units. What would the nominal dimensions be in the metric system?
- Obtain some machine screws with metric threads and dimensions (foreign cars use them). What are the closest sizes in our customary system? Are any of these interchangeable? Why or why not?
- Develop a set of plans for a bird house, lawn building, workbench, or other project in metric dimensions. (If the metric plan is based on one designed in customary units, round dimensions to rational metric values.) Then build the item, using only metric measuring devices.
- Obtain precision metric measuring tools such as a micrometer, vernier caliper, and dial indicator. Practice using them on metal and plastic parts.
- Determine the weight of an automobile in metric units. Weigh a wheel with tire in metric units. Calculate the capacity of an autojack in metric units.
- Determine the metric unit operating limits of various machines in the shop. Example: drill press stroke, lathe swing, saw cut, and so forth.
- Measure pressures such as tire, water, and oil in metric units. What metric unit would be used for this?
- Read the directions on a can of paint. How much area in metric units will it cover? Discuss changing paint can sizes to correspond to whole numbers in metric units (hard conversion).
- Find the dimension of a mechanical drawing in metric measurement. What are the possible ways of displaying both customary and metric measurements on a drawing?
- How will mechanics' tools be affected—wrenches, taps, and dies?
- Architectural drawing and material lists of supplies will change. List the area where metrication will be involved. What will happen to the 4-inch module?
- What is the normal ± tolerance in the metric system for a mechanical drawing? How is this tolerance specified in the metric countries? Is this method likely to be adopted here?
- How would you write the U.S. electrical standards in metric standards?

ADDITIONAL SOURCES OF INFORMATION

National Bureau of Standards, U.S. Department of Commerce, Washington, D C 20234

American National Standards Institute, 1430 Broadway, New York, NY 10018

American National Metric Council, 1625 Massachusetts Ave., N.W., Washington, D C 20036

American Society for Testing and Materials, 1917 Race St., Philadelphia, PA 19103

U.S. Metric Association, Sugarloaf Star Route, Boulder, CO 80302

National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091

National Education Association, 1201 16th Street, N.W., Washington, D C 20036

National Science Teachers Association, 1201 16th Street, N.W., Washington, D C 20036

PUBLICATIONS

American Metric Journal. Published bimonthly by AMJ Publishing Co., Tarzana, CA 91356. Subscription: $35 a year, single copy $6.50.

*Barbrow, Louis E. *What About Metric?* National Bureau of Standards. Consumer Information Services 7, 1973. $1.10 (Stock No. 0303-01191).

Metric News. Published bimonthly by Metric News Inc., 830 N. 109th St., Milwaukee, WI 53226.

Metric Reporter. Published biweekly by the American National Metric Council, 1625 Massachusetts Ave., N.W., Washington, D C 20036. Subscription: $35 a year.

**Some References on Metric Information.* National Bureau of Standards, Spec. Publ. 389. Revised Aug. 1974. 35¢. (SD Catalog No. C13.10:389).

**The International System of Units (SI).* National Bureau of Standards, Spec. Publ. 330, 1974. 65¢. (SD Catalog No. C13.10:330/2).

*Order from the Superintendent of Documents, U.S. Government Printing Office, Washington, D C 20402. Where an SD catalog number is listed, use it when you order.

© Sears, Roebuck and Co., 1974
Revised 1975, 1976, 1977

Consumer Information Services — D/703
Sears, Roebuck and Co.
Sears Tower
Chicago, IL 60684